

Remarks

Elections/Restrictions:

The provisional election to prosecute without traverse the invention of Group I, claims 1 and 4, as discussed in a telephone conversation with Examiner Garcia on April 1, 2003, is affirmed. Claims 2, 3, and 5-7 are withdrawn from further consideration by the Examiner as being drawn to a non-elected invention.

In the Specification:

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. Correction of the following was required by the Examiner: In claim 1, line 18 the phrase “means for attaching the housing to a support arm of a suspension arm”, and in claim 4, lines 1-3, the phrase “the means for attaching the housing to a support arm of the suspension system is external threads on the external surface of the middle portion of the housing.” The applicant respectfully disagrees with the Examiner’s objection because the “means for attaching the housing” refers to, and has antecedent basis in, the threaded portion (5) on the external surface of the mid portion of the housing (4). Threads (5) are supported by the specification on page 3, line 29, on page 7, line 15, and in Figure 6. As discussed in the specification on page 8, lines 1-8, threads (5) engage the internal threads (28) of socket (16), and socket (16) is in turn secured to the suspension system. Thus, threads (5) are a means for attaching the housing to an external body.

The amendments to the specification on page 5, lines 20-31, page 6, lines 1-14, and page 7, lines 18-29, have been made to correct typographical errors in the text.

As regards page 5 of the specification, the word "treaded" has been replaced with "threaded", and erroneous references to "shaft 3" have been corrected to recite "shaft 2".

As regards page 6 of the specification, line 5, reference to Figure 6 has been changed to Figure 8 so as to properly and clearly illustrate void 25.

As regards page 7 of the specification, erroneous references to "ball 2" have been corrected to recite "ball 3". On page 7, line 23, reference to Figure 6 has been changed to Figure 8 so as to properly and clearly illustrate void 25. Also on page 7, the recitation of "socket 16" on lines 27 and 28 is in error, and has been replaced with "housing 4". This change is related to the description of shallow channels 26 formed in housing 4 for lubricating ball 3. Formation of these channels in socket 16 is nonsensical since lubrication is not required between housing 4 and socket 16. This correction does not add new matter to the specification because it is supported by original figure 6, where shallow channels 26 are shown in the interior surface of housing 4.

In the Drawings:

The amendment to the drawings in Figure 8 has been made to illustrate void 25 between the truncated upper surface of the ball, housing 4, and retaining member 6. In the original specification (page 6, line 5, and page 7, line 23), void 25 was described with respect to Figure 6 but was, erroneously, not labeled thereon. Figure 8 has been amended to include void 25 rather than Figure 6 because this feature will be better represented in Figure 8 for reasons of clarity and accuracy.

The amendment to the drawings in Figure 9 has been made to correct a mislabeled reference number, wherein nut 31 was erroneously labeled nut 27. This correction is supported in the specification on page 5, line 10.

The drawings are objected to for not showing every feature of the invention specified in the claims. Specifically, the Examiner requested that “the attachment” recited in claim 1, line 6 be shown in the drawings. Furthermore, claim 1 was objected to because the Examiner objected to the word “attachment” in claim 1, line 6. The applicant has amended claim 1 to recite “...at the highest point opposite the attachment upper end of the elongated shaft....” By using the word “attachment” in the original claim 1, the applicant unintentionally implied that an attachment means was used to secure the ball to the elongated shaft. Rather, the applicant’s inventive ball is rigidly fixed to the upper end of the elongated shaft so that the shaft and ball are unitary or monolithic. The above amendment to claim 1 clarifies the claim and obviates the objections to both claim 1 and the drawings. Drawings have not been corrected to show “an attachment” in this amendment since an “attachment” is no longer claimed. No new matter is entered because this language is supported by the specification on page 6, lines 1-2, and in the original drawings.

In the Claims:

Claims 1-7 are pending in the application. Claims 2, 3, and 5-7 are withdrawn from consideration by the examiner as being drawn to a non-elected invention. New claim 8 has been added to the application in this Amendment A.

Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizusawa et al. in view of Edwards. Regarding claim 1, the Examiner states that Mizusawa et al disclose all the features recited in claim 1 except a lubricating port, that Edwards teaches employment of a lubricating port and duct to lubricate a ball joint, and

that it would have been obvious to include the lubricating port and duct of Edwards in the ball joint of Mizusawa et al.

The applicant respectfully disagrees that modification of Mizusawa et al by addition of lubricating port and duct as taught by Edwards is obvious since lubrication of the ball within the assembly of Mizusawa et al would render the invention of Mizusawa inoperable. Specifically, Mizusawa et al employ a plastic socket (col. 2, line 63) and metallic ring 27 to retain a ball of a ball stud within the socket for use in gas spring joints in the rear doors of automobiles (col 1, line 63). The applicant asserts that adding a lubrication port and duct to the plastic socket and retainer of Mizusawa et al is redundant since the interface of the metallic ball with the plastic socket is essentially self lubricating by virtue of the well known low-friction material properties of plastic. Further, the addition of lubrication to the assembly taught by Mizusawa et al may cause the metallic retaining ring 27 to more easily slide over and disengage from the ball, causing failure of the device. Finally, there is no suggestion within either reference to combine the lubrication port of Edwards in the plastic socket disclosed by Mizusawa et al.

It should be noted that the ball joint assembly taught by Mizusawa et al., intended for use in automobile door joints, is a completely different joint than that disclosed by the applicant. The applicant's ball joint assembly is designed and fabricated from high strength materials such as hardened steel for use in the suspension systems of high performance automobiles, such as those used in automobile racing. The applicant's invention must withstand high wear, stresses, and pressures, and be easily repaired or replaced. The applicant's invention employs lubricant not only to reduce friction within

the assembly, but also to apply pressure to ball 3 to maintain its position within the assembly. The plastic ball joint assembly with wire ring retainer disclosed by Mizusawa et al not only does not require lubricant, but would be compromised if so modified.

Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scheublein, Jr. et al in view of Mizusawa et al., and Maughan. Regarding claim 1, the Examiner states that Scheublein, Jr. Et al. disclose a housing (91) which is internally conformed at the lower end (92) of the housing. Although the applicant agrees that Scheublien Jr et al disclose a conformed lower end, the applicant respectfully disagrees that the lower end of Scheublein Jr et al disclose a "*housing being internally conformed at the lower end to seat the ball...*" as recited in claim 1, line 14. Scheubliein Jr et al is internally conformed to receive sintered bearing member 96 and bearing race 97 (col. 5, lines 53-56), and the internal conformation is distant from ball100.

Further, the Examiner states that Scheublein Jr et al's middle portion (A14) is internally threaded, and refers the applicant to col. 5, lines 5-61. Note that internal threads are described within the upper portion 102 of housing 91 to receive a jam nut therein (col. 5, lines 59-61). The applicant respectfully asserts that the middle portion, as commonly understood and as marked by the Examiner in his attached drawing, of Scheublein Jr et al does not show internal threads, but rather shows *external* threads (95).

Because Scheublein Jr et al do not disclose the following elements of claim 1: 1) a housing being internally conformed at the lower end to seat the ball, .2) Internal threads on the middle portion of the housing, 3) fastening means for fastening the retaining member in the housing, or 4) a ball having a truncated upper surface, the applicant disagrees that claim 1 is unpatentable over Scheublein Jr. et al.

The Examiner states that it is obvious to provide the truncated flat face on the ball, as taught by Mizusawa, in the ball joint assembly disclosed by Scheublein Jr et al. The applicant respectfully disagrees. Replacement of the arcuate surface disclosed by Scheublein Jr et al with a ball having a truncated upper surface as shown by Mizusawa would render the invention of Scheublein Jr et al inoperable since the truncated surface would not cooperate with adjustment element 103 of Scheublein Jr et al. Because the invention of Scheublein Jr et al as modified by the teaching of Mizusawa would be inoperable, the applicant disagrees that claim 1 is unpatentable over Scheublein Jr et al in view of Mizusawa.

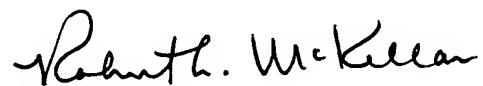
The Examiner states that Scheublein Jr et al in view of Mizusawa, in further view of Maughan teaches the employment of fastening means for fastening a member within a housing. Because the applicant's invention is not obvious in view of Scheublein Jr et al alone, and in view of Scheublein Jr et al as taught by Mizusawa , the applicant respectfully asserts that the applicants invention is not obvious in view of Scheublein Jr et al as taught by Mizusawa, in further view of Maughan.

As regards claim 4, the Examiner states that Scheublein Jr et al disclose attaching means in the form of external threads 95 on the external surface of the housing. However, because Because Scheublein Jr et al do not disclose the following elements of claim 1: 1) a housing being internally conformed at the lower end to seat the ball, .2) Internal threads on the middle portion of the housing, 3) fastening means for fastening the retaining member in the housing, or 4) a ball having a truncated upper surface, the applicant disagrees that claim 4, because it is dependent upon claim 1, is unpatentable over Scheublein Jr.et al.

New claim 8 has been added to the application to include the inventive feature of forming shallow channels 26 within the interior wall of housing 4 for purposes of lubrication and air venting around ball 3. This feature is supported in the specification on page 2, line 26 to page 3, line 4, and on page 7, lines 25-29, and in Figure 6.

The present application is now believed to be in condition for Allowance and such action is kindly requested.

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APPENDIX B

Changes To The Specification Marked In Red

In another embodiment, there is a combination of the ball joint described just above, and a socket to provide a ball joint system. The socket comprises a cylindrical housing having a wall with an internal surface wherein the internal surface is 5 threaded to receive the housing in it and the socket has a means of attachment for attachment near a terminal end of a carrier for the ball joint system.

Finally, there is an additional embodiment of this invention that is an automotive suspension system incorporating the ball joint systems described just above.

BRIEF DESCRIPTION OF THE DRAWINGS

10 Figure 1 is a full view of a ball joint system of this invention that is fully assembled.

Figure 2 is a full view of the ball and the elongated shaft of this invention.

Figure 3 is a full view of the housing of this invention

15 Figure 4 is a full top view of the housing of this invention without the retaining member in place

Figure 5 is a full top view of the housing of this invention with the retaining member in place.

Figure 6 is a full cross-sectional view of the housing of Figure 3 through the lines 100-100 of Figure 3 and also showing the ball therein.

20 Figure 7 is a full view of the retaining member of this invention.

Figure 8 is a full cross-sectional view of the retaining member of Figure 7 through the lines 200-200 of Figure 7, and includes the ball and shaft therewithin.

Figure 9 is a full view of a fully assembled ball joint system of this invention and including the socket.

25 Figure 10 is a full top view of the socket of Figure 9.

Figure 11 is a schematic drawing of one type of automotive suspension system showing the use of the ball joint systems of this invention.

30 Figure 12 is a full view in perspective of a portion of the suspension system of Figure 11, wherein there is shown a wishbone support arm containing a ball joint system of this invention.

Figure 13 is a full top view of the wishbone support arm of Figure 12.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to the Figures, and with reference to Figure 1, which is a full view of a ball joint system 27 of this invention that is fully assembled. There is shown as the components thereof, an elongated shaft 2, and the ball 3 (only a portion of the bottom of the ball is shown therein), the housing 4, with external threads 5, a retaining member 6, and a fastening means 7, which is a set screw 8 set into a threaded (not shown) opening 9, in an upper flange 10 of the housing 4.

It should be noted that the elongated shaft 2 is threaded at its lower end 11, and that there is an opening 12 though the threaded portion 13 of the elongated shaft 2 to accommodate a cotter pin (not shown), or the like, to retain a nut 31 (see Figure 9), which in turn retains the elongated shaft 2 in a portion of a suspension system that is discussed below. It is contemplated within the scope of this invention to provide ball joints wherein the shafts 2 are provided in various lengths. The reason for the various lengths is that in racing, it is desirable to alter the suspension angles and positions to affect handling, i.e., roll centers, camber gain and other related geometry. Having ball joints with variable length shafts gives the users an option for altering the suspension geometry of the automobile using the ball joints. Currently, racers will change or alter the spindles to make the same geometry changes, and this provides an increased cost, as the spindles are about 6 to 7 times more expensive than the ball joints of this invention.

Figure 2 is a full view of the combination 1 of the ball 3 and the elongated shaft 2 without the remainder of the components being shown, for clarification. Thus there is shown the ball 3, the elongated shaft 2, a truncated flat surface 14 at the topmost point of the ball 3, and the threaded portion 13 at the lower end 11, along with the opening 12.

What is meant by "longitudinal axis running through said upper end and said lower end" is shown by the line 300-300 in Figure 2, which indicates the principal axis that the ball 3 would revolve around, it being understood that the ball will tilt from this axis within the housing 4 to provide flexibility in the ability of the ball 3 to coordinate with the suspension systems noted *infra*, and the degree of movement within the housing 4 is limited only by the contact of the elongated shaft 2 with the lower edge 15 of the housing 4, and/or the connection that the elongated shaft 2 has with the suspension system and the wheel 33 shown in Figure 11.

It should be noted that the preferred combination 1 of ball 3 and elongated shaft 2 is that in which the two are joined as a unitary component. This combination is manufactured from hardened steel or the like to endure the wear that usually accompanies such devices. The truncated flat surface 14 is provided so that there is a space or void 25 (see Figure 6) formed above the ball 3 when in the housing 4. The space 25 is intended to contain lubricant, namely, a thickened oil or grease which is not shown in this Figure, but which can be any common lubricant known in the art. Filling the void 25 above the truncated surface 14 allows for pressure to be applied to the ball 3, while in the housing 4, and is employed to help seat the ball in the seat 18 (see Figure 4) provided at the lower end of the housing 4. The pressure created by lubricants inserted into the void 25 is also a means to help adjust the ball 3 in the housing 4 to accommodate for any wear on the ball 3. As far as is known by the inventors herein, this means of accommodating for wear on the ball 3 is not known independently of mechanical means, or as a sole means for providing such pressure.

15 The housing 4, which houses and seats the ball 3 is shown in Figure 3. With reference to this Figure, there is shown the threaded exterior surface 5, which inserts into the socket 16, that is described *infra*, the lower edge 15, which in this Figure is beveled to fit into the bottom of the socket 16, the flange 10 which is configured such that it can be used to turn the housing 4 into the socket 16, and in this Figure, the flange 10 is shown as 20 a hexagon configuration also any convenient configuration that allows the turning of the housing 4 is contemplated within the scope of this invention. In the side surface of the flange 10, there is shown a fastening means 7 for the housing 4, to retain the retaining member 6 in the housing 4, which fastening means 7 is comprised of a simple set screw combination wherein there is shown the threaded opening 9, into which a set screw 8 is 25 inserted and turned down to complete the fastening. The type of fastening means 7 is not critical in this invention, and any fastening means which will secure the retaining member 6 in the housing 4 and which is fairly simple to use, is acceptable.

With reference to Figure 4, which is a top view of the housing 4, there is shown the flange 10, the fastening means opening 9, in phantom, the internal threads 17 for 30 accommodating the external threads 18 of the retaining member 6, and the seat 18 for the ball 3, which is located near the bottom edge 15 of the housing 4.

Further, with reference to Figure 5, which is a top view of the housing 4, wherein there is shown the flange 10, therein is situated in the housing 4, a retaining member 6, wherein there is shown the top 19 of the retaining member 6, a concavity 20 in the top 19, and detachedly fixed in the concavity 20, a grease zerk fitting 21. Generally, such grease 5 zerk fittings 21 are threaded and screwed into a threaded opening and that is contemplated within the scope of this invention as well as any convenient means of inserting and fastening the grease zerk fitting 21. Also shown in this Figure are indentions 22, which are indented in the wall of the concavity 20, which indentions 22 are useful for applying a wrench or some other viable means to turn the retaining member 10 6 in and out of the housing 4. The indentions 22 are not critical to this invention and can be optionally included in the retaining member 6, and can be configured other than as an indentation as shown.

Reference should also be made to Figure 6, which is a cross-sectional view of the housing 4, taken through line 100-100 of Figure 3, wherein there is shown the flange 10, the opening 9, the set screw 8 tail end, the external threads 5, and the internal threads 17, 15 which accommodate the external threads 24 of the retaining member 6 (see also Figures 7 and 8).

With further reference to the retaining member 6, reference should be made to Figure 7, which is a full view of the retaining member 6, showing the top 19 and the 20 external threads 24. Figure 8 is a full cross-sectional view of the retaining member 6 through line 200-200 of Figure 7, wherein, there is shown the top 19, the external threads 24, the concavity 20, and the grease fitting 21. Also shown is the duct 23, which ~~carries~~ ^{allows} lubricant applied to the grease fitting 21 to be carried to the void 25 (see Figure 6), 25 wherein the ball 3 is shown and wherein the majority of the lubricant resides. Also shown in Figure 6 are the shallow channels 26 which in the prior art ball joints are typically placed into the ball ³, but which in this invention are placed in the interior of the ~~housing 4~~ ^{housing 4}. The reason for this placement of the shallow channels 26 is primarily cost, as placing the shallow channels 26 in the ~~socket 16~~ ^{housing 4}, means that expensive machining does not have to be done in the ball ³, which is the part that is replaced more often.